

## CLAIMS

WHAT IS CLAIMED IS:

- 5 1. A method for manufacturing an optical waveguide refractive index grating having a desired grating pitch  $\Lambda$ , the method comprising the steps of:

providing a photosensitive waveguide;

providing a writing beam of actinic radiation, the writing beam having an intensity;

translating the waveguide relative to the writing beam at a velocity  $v(t)$ ;

modulating the intensity of the writing beam as a function of time at a

frequency  $f(t)$ , wherein  $\frac{v(t)}{f(t)} \approx \Lambda$ ;

the step of modulating the intensity of the writing beam as a function of time at a frequency  $f(t)$  comprising the step of varying  $\Lambda$ .

- 15 2. The method of claim 1, including the steps of translating a chirped phase mask through the writing beam to create an interferogram of a changing period  $\Lambda(t)$ , where

$$\Lambda(t) = \Lambda_s + \frac{d\Lambda}{dt} \cdot t,$$

where  $\Lambda_s$  is a starting period;

- 20 the step of modulating the intensity of the writing beam by varying of  $\Lambda$  wherein,

$$f(t) = \frac{v}{\Lambda_s + \frac{d\Lambda}{dt} \cdot t}$$

to maintain a resonance condition

3. The method of claim 1, the step of providing a writing beam comprising providing a writing beam having a peak intensity illuminating the fiber  $I_0$  and a width  $D$ ,

wherein the fluence  $\Phi(x)$  delivered to the waveguide is determined by the equation

$$\Phi(x) \approx \frac{I_0(x)}{4} \cdot \frac{D}{v(x)} \cdot \left\{ A(x) - \frac{m(x)}{2} \cdot \cos \left[ \frac{\omega(x)}{v(x)} \cdot x \right] \right\},$$

wherein  $A$  is an offset and  $m$  is fringe visibility.

- 5 4. The method of claim 1, wherein the varying-period interferogram is produced using a tunable interferometer.
5. A long-length phase continuous Bragg grating manufactured in accordance with the method of claim 1.
6. The grating of claim 5, the grating having a length of at least 2.5 meters.
- 10 7. The grating of claim 5, wherein the grating has a length of at least four meters.
8. The grating of claim 5, wherein the grating is a continuous phase Bragg grating.
9. The grating of claim 5, wherein the waveguide is a photosensitive optical fiber and the grating is a continuous refractive index perturbation.
10. The grating of claim 5, wherein the index perturbation has a changing periodicity along the length of the grating.
- 15 11. The grating of claim 5, wherein the step of translating included placing the waveguide on a rotary stage.
12. The grating of claim 5, where in the grating is chirped.
13. An optical dispersion compensator comprising the grating of claim 5.
- 20 14. A broadband light generator comprising the grating of claim 5.
15. A rapid spectral interrogator comprising the grating of claim 5.
16. A sensor comprising the grating of claim 5.
17. A method for writing a refractive index grating having a desired grating pitch  $\Lambda$  on an optical waveguide, the method comprising the steps of:
  - 25 providing a writing beam of actinic radiation;
  - translating the waveguide relative to the writing beam at a velocity  $v(t)$ ;
  - modulating the intensity of the writing beam as a function of time at a frequency  $f(t)$ , wherein  $\frac{v(t)}{f(t)} \approx \Lambda$ ;

the step of modulating the intensity of the writing beam as a function of time at a frequency  $f(t)$  comprising the step of varying  $\Lambda$ .

18. A grating manufactured in accordance with the method of claim 17.